Ethical Intelligence for Decision Making From Human Value Education Perspective

SHORT SYNOPSIS

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by

Shweta Bhatnagar
20/Ph.D/024

Under the supervision of
Dr. Rashmi Agrawal
Professor, School of Computer Applications

SCHOOL OF COMPUTER APPLICATIONS

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES
SECTOR-43, SURAJKUND –DELHI ROAD, FARIDABAD – 121001

SCHOOL OF COMPUTER APPLICATIONS

Certificate

I hereby declare that the short synopsis "Ethical Intelligence for Decision Making from Human Value education perspective" being submitted in partial fulfilment of the requirement for the degree of Doctor of Philosophy in Computer Applications under School of Computer Applications of Manav Rachna International Institute of Research & Studies, Faridabad during the academic year 2021-22

It is a bona fide record of original work carried out under the supervision of Prof (Dr) Rashmi Agarwal, Professor, School of Computer Applications and has not been submitted in full or part to any other university or institute for degree or diploma. Further, it is certified that short synopsis is plagiarism free and proof has been submitted.

Shweta

(Ms. Shweta Bhatnagar)
20/Ph.D/024

Signature of the Supervisor

(Dr Rashmi Agrawal, Professor,
School of Computer Applications)

(Chairperson, DRC)

(Dean, School of Computer Applications)

Abstract

Technology has taken the forefront in many areas of our daily lives. With the dawn of artificial intelligence, it has become more important to focus on using ethical intelligence in decision-making. This research attempts to uncover the complexities of the ethical intelligence architecture by using Philosophical studies as the base. The research is an attempt to address the metaphysical concepts using scientific methods. Ethical intelligence is built on the ethical framework developed to address dilemmas. The research aims at proposing a model for ethical intelligence in decision-making.

Keywords: Human Values, Ethical Decision Making, Ethical Tools, Explainable Artificial Intelligence, Ethical Intelligence, Moral Education, Artificial Intelligence in Education, Artificial Intelligence in Value Education

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Need for Value Education in the Digital Era

Value education is the heart of wisdom. Value education helps the learner to take decisions in real life. The subject-specific knowledge can be an additional aid in making accurate decisions in specific contexts, but correct decisions in life are primarily based on values and ethics. Higher order thinking skills require leadership traits, which character education can build. Without value education, the knowledge is partial and only for mechanical work. If a nation wants to develop individuals who can take correct decisions at the right time, value education is necessary. The world has seen enough destruction in the absence of value education.

Value Education Initiatives of the post-independence period in India include the recommendations of Kothari Commission (1964-66), National Policy of Education (1986 with 1992 modifications), National Curriculum Framework (1988) and the recommendations of Parliamentary Standing Committee on Human Resource Development — Eighty First Report on Value based Education (1999). The National Education Policy 2020, in point 11.8, mentions the value of education as an integral part of the education system. Virtues like collaboration, honesty, righteous conduct, service/seva, peace, compassion and contentment are getting accepted worldwide and are part of student curriculum in India. According to the National Education Policy 2020, constitutional and human values of Truth, Dharma, Shanti, Ahimsa and Prem along with scientific temperament have to be developed in students. Community engagement and a sense of service are traits identified for development in learners. Since new education also involves global education, online education learners are more in need of ethical education products.

The core values in the Vedic literature are timeless (Sanatan) and, therefore, still relevant. Vedic values can be mapped according to the present digital learning environments. There is a significant change in the learning environment and technology; therefore, challenges to be addressed by the same values have taken a different form. The values from ancient times can be made relevant to modern times by mapping them to the present context. Tools for helping the learner practice ethical decision making can be developed using Artificial Intelligence and Machine Learning techniques.

The study aims to develop a digital tool that helps practice ethical decision-making through intelligence built into the system.

Description of Broad Area

Post the Pandemic, the methods of imparting education have changed completely. Many International and National initiatives have adapted to the online teaching method, developed sophisticated tools that help students form networks, collaborate, practice skills, etc. through Education Technology. They find it difficult to find value in reverting to the more costly face-to-face learning mode [1]. Although, Education technology has been around for a while, the use of artificial intelligence for personalization has recently been the focus of many entrepreneurs.

A. Artificial Intelligence in Education

There has been reasonable research on applications of Artificial Intelligence in education. The concept of Education 4.0 with customization and personalization for the learner has grown with the development of technology. AI based Technology solutions are given for creating Smart Campuses for engaging personalised experiences, teaching aids like chat-bots, curriculum builders, e-proctoring, attendance systems, interactive teaching through robots, virtual laboratories, augmented and virtual reality based learning.
Applications are built using the machine learning algorithms, natural language processing techniques, visualization techniques and programming languages like python.

B. Artificial Intelligence in Ethical Education

Artificial Intelligence in ethical education is an emerging field. Unlike the use of AI in conventional education, use of AI in ethical education requires multidisciplinary approach. All the aspects of conventional AI in education can be mapped to ethical education using ethical development methods such as explainable AI and Value Sensitive Design methodology [2].

Literature Review

Howard J Cruzer (2018) [3] in his research article ‘Yesterday’s Virtue Ethicists Meet Tomorrow’s High Tech: A critical response to technology and the Virtues by Shannon Vallor’, has mentioned that the values of the traditional teaching methods are challenges by the new digital learning environment. It is important to apply the values of the traditional times, with required modifications, on the new learning platforms, so that learners can practice the morals as they study. The paper compared values of different philosophers to try and reach a consensus on some common values. Then the moral principles and philosophies of the traditional thinkers are studied in the virtual world's present context and reordered and reprioritised for the 21st century learners. Some of the values that are threatened by technology are listed. The discussion also mentions how the values need to upgrade themselves to stay relevant in present context. Although the paper is sufficient to highlight the areas of concern in the field of value education, but there are specific gaps.

a. The actual implementable designs that work well with technology are missing.
b. Further detailed research into the implementation aspects of values in learning platforms is possible.

Matthew Dennis and Tom Harrison (2020) [4], in their article 'Unique Ethical Challenges for the 21st Century: Online Technology and Virtue Education', mention that virtue education is practised as character education, which helps build future leaders in the new digital age. This implies that the educators have to influence not just the design of technology, but also the behaviour of the learners. It is important for the learner to follow the online rules (ethics created for the learning environment) through self-discipline and understand the reason and logic behind the rules created for online learning. This would help the learner remain ethical, even when the rules are not enforceable. Learners can develop cyber-wisdom, which is an ever-evolving state of taking moral decisions, when online. Cyber-wisdom increases as one spends time online and learns from experience. As mentioned above, it is important to first identify and bring moral dilemmas in conscious decision-making, then address them through cyber-wisdom.

a. The paper does not give an account of complete set of moral values that can be addressed by the learning environments, but identifies the steps of building cyber-

virtues through literacy, motivation, perception and reasoning, and practice and reflection of values.

b. The paper can be used as basis for creation of a model, which identifies the moral values useful for a specific domain such as technology

Benzmüller, Christoph; Parent, Xavier; Torre, Leendert van der (2020) [5], in their paper 'Designing normative theories for ethical and legal reasoning: LOGIKEY framework, methodology, and tool support', suggest an ethico-legal framework of rules written in HOL, which is able to help the application make an ethical decision. The court rulings are taken as logics for the system's decision-making module. The logics implemented in the model included deontic logics that deal with permissions, obligations and prohibitions; and norm –based deontic logic which applies a set of rules if certain conditions are met. It also included inference rules, generalizations etc. The ethico-legal framework has the following gaps:

a. The legal regulations in every country are different and cannot be universal
b. The framework is a base for a computer application, and therefore can be said to be in early stages of development

Park, Namkee; Jang, Kyungeun; A, Seonggyeol Cho; Choi, Jinyoung (2021) [6], in the paper 'Use of offensive language in human-artificial intelligence chatbot interaction: The effects of ethical ideology, social competence, and perceived humanlikeness' conducted a survey that profiled the chat-bot users on the basis of their orientation towards ethical ideology, human-likeness of the bot, frequency of use of bot, and social competence. The chat bot handled avoidance of use of profanity through techniques designed based on user profiles. The chat bot development has the following gaps:

a. The data was tested on limited audience with similar demographics, yet it can be the basis for development of question answer methods for ethical situations
b. The concept can be enhanced to include other situations of unethical behaviour

Chubb, Jennifer; Missaoui, Sondess; Concannon, Shauna; Maloney, Liam; Walker, James Alfred (2021) [7], in their paper 'Interactive Storytelling for Children: A Case-study of Design and Development Considerations for Ethical Conversational AI', created an

application for storytelling, which also allows children to engage in interaction with the characters to understand them more. Children can recreate a new story by engaging in conversation with the characters. This immersive way of learning improves outcomes. The use of Natural language understanding (NLU), dialogue generation (DG) and natural language generation (NLG) (as part of conversational artificial intelligence (CAI)), were used for understanding the child's questions and for answering them. The application was found to have the following limitations:

a. The interactive storytelling method for improving learning is a conceptual framework, yet it can pave way for solutions in Human Computer Interaction for unstructured responses
b. The ethical concerns for child-computer interaction can be structured for more meaningful interactions with adults

Smakman, Matthijs; Vogt, Paul; Konijn, Elly A. (2021) [8], in their reserch paper 'Moral considerations on social robots in education: A multi-stakeholder perspective', anaysed the responses of 118 participants on the perceptions about social robots with regards to Psychological welfare and Happiness, Applicability, Freedom from bias, Usability, Friendship and Attachment, Trust and Deception, Human Contact, Autonomy, Flexibility, Privacy, Security and Safety, Responsibility and Accountability. The paper uses Value Sensitive Design methodology to identify the stakeholders and ascertain values relevant for the study. The paper has the following gaps:

a. The paper is a conceptual work on social robot ethics. It can be enhanced for building models and methods in ethical decision making
b. It can be mapped to stakeholders of higher education

Some of the work done on Artificial Intelligence in education, relevant for the research, can be summarised as below:

Paper Title and Author	Application area (Utility)	Sample size	Data Source	Technologies used	Limitations
Multiclass Prediction Model for Student Grade Prediction Using Machine Learning					
[9]	Prediction Model for Student Grade Prediction Using multiple variables as basis for Machine Learning predictions	1282 instances	Department of Information and Communication Technology (JTMK) at one of the Malaysia Polytechnics	Decision Trees, Support Vector Machine (SVM), Naïve Bayes (NB), K-Nearest Neighbour (kNN), Logistic Regression (LR) and Random Forest (RF). Synthetic Minority Oversampling Technique (SMOTE)	Although the data is trained using multiple models but the data is not simplified using multiple techniques. Only SMOTE is used. More work in this can create generalised model.
Online Student Authentication and Proctoring System Based on Multimodal Biometrics Technology					
[10]	Student Proctoring system with biometric verification and check on cheating	NA	NA	DNN to train machine on facial images; CLAHE algorithm for light normalization; multi-level, multi-modal and multi-task learning for face recognition RNN based on LSTM for voice recognition (identification of d-vector) CNN+RNN for typing recognition	The study is the comparison of commercially available proctoring solutions. The results are based on survey, which can be replaced with actual data results from use in academic institutions.
Wearable Technology in Education: A Systematic Review					
[11]	Literature Review of wearable	NA	NA	A brief discussion on technologies like google glass, fitbit, oculus rift, emotive insight,	The literature review is done for the past one decade on wearable technologies in education and the

	educational products			Samsung gear, apple watch, Empatica, sensewear, etextiles, tactile vest, hip disk, motiv GI, leg mounted RFID, Go Pro 4 and fitbit iconic, head and pen motion modules was made	summary is for the future work in the same direction, while considering the ethical and privacy issues of technology.
Bloom's Learning Outcomes' Automatic Classification Using LSTM and Pre-trained Word Embeddings					
[12]	Classification of questions into BLOOM's levels	1429 instances	Sukkur IBA University and Najran University, Saudi Arabia Dataset	LSTM model Wiki Word Vectors pre-trained word embedding	The classification model is tested, consulted with experts and compared with other techniques, but can be enhanced to use live voice recognition to make it more autonomous
Enhancing Learners' Experience through Extending Learning Systems					
[13]	Automating online quiz creation with visualizations	NA	NA	Python for creation of Quiz Making Language and LMS automator SQL for ad-hoc report plugin Microsoft Power BI (Pro) Selenium API is used for loading pages BeautifulSoup Learning Tools Interoperability (LTI) standard for TEDEd login without signin	The system is a good assembly of plugins and tools that creates a unique platform for learner experience, but a common plugin for all can create a better setup facility for a more standardized approach for Moodle LMS
3-D Interactive Control Laboratory for Classroom Demonstration and Online Experimentation in Engineering Education					
[14]	3-D visualization and interactive laboratory for	NA	NA	MATLAB/Simulink environment 3DS Max for 3D modelling PD control algorithm for movement control	The paper is an independent work of a single laboratory and can be enhanced to include the work of other laboratories for wider application.

	a particular subject				
Individualized AI Tutor Based on Developmental Learning Networks					
[15]	Sharing personalized learning resources with learners for enhanced learning experience	800000 input data	Primary data generated from of 1000 users	Input channel addition algorithm Event bundle encoding algorithm Alternative template learning algorithm	The tutor is for a language course and can be enhanced to include other subjects with different pedagogies, which might require a different recommendation model
JAICOB: A Data Science Chatbot					
[16]	A chat-bot for teaching	10567 posts	Web scraping techniques for FAQs, Five different age-oriented chat rooms at an internet chat site	Speech Act Classifier SVM algorithm Google's Dialog-Flow technology	The algorithm cannot be expanded to include other subjects because most of the FAQs were collected from websites devoted to Data Science
PCRS: Personalized Career-Path Recommender System for Engineering Students					
[17]	Career path recommender System for high school students in Palestine	1257 students	An-Najah National University students' data and Palestinian Central Bureau of Statistics (PCBS) data for unemployment	Fuzzy logic based on the Mamdani inference	The application is limited to Palestine students because of the economic and cultural conditions of leaners are different in each country.

Visualizing Student Opinion Through Text Analysis					
[18]	Creating visualization of student sentiments through questionnaire answers for evaluating learner sentiments	2254 responses	Queensland University of Technology (QUT) dataset containing student satisfaction feedback	latent Dirichlet allocation (LDA) statistical method Sentiment Analysis Natural Language Toolkit in Python for data cleaning POS tags to remove unnecessary words AFINN dataset	Although it is a well proven model for sentiment analysis, but data needs to be standardized to be able to be implemented widely.
EKT: Exercise-aware Knowledge Tracing for Student Performance Prediction					
[19]	Exercise-aware Knowledge Tracing for Predicting Student Performance	50,00,000 records of 84,909 students and 15,045 exercises	Dataset supplied by iFLYTEK Co., Ltd. was collected from Zhixue	Recurrent Neural Networks are used for creating the prediction model for the learner performance.	Several other available techniques could be experimented with and the results can be improved by combining with overfitting techniques
Bridging Education and Labor Skills by a Novel Competency-Based Course Linked-Data Model					
[20]	Capability and skill matching for open educational resources, MOOCs and open courseware	NA	NA	W3C standards, such as RDFs and OWL Linked-data ontologies Protégé LOV plugin OOPS tool for validation	The application does not use AI for automation. The addition of AI to map course outcomes with the market skills
Artificial Intelligence, the Missing Piece of Online Education?					
[21]	Building AI players for	NA	NA	Robotic 'Equilibrium Player' Ultimatum Game	The paper is a theoretical framework exemplifying the use of AI in

	asynchronous learning				education. The applications can be tested for more concrete results and comparisons
Predicting Academic Performance Based on Learner Traces in a Social Learning Environment					
[22]	Predicting academic performance on the basis of social media engagement by learners	19000 social media posts, 2609 blog activities, 5470 tweets, 10895 wiki page activities	343 students from Web Applications Design course, Department of Computer Science from the University of Craiova, Romania	Random forest, K-Nearest Neighbour, Large-margin nearest neighbour regression. Creation of numeric features for the social media activities as data set. Regression models were applied in Weka tool	The results are dependent on the learning and teaching methodologies implemented in this course. For generalizations these have to be studies further for internal and external conditions.

Research Gaps

The study reveals the following gaps in existing research

1. Universal Human Values relevant for AI based Ethical Decision model, which are applicable for global stakeholders, requires development of a framework using Artificial Intelligence tools
2. The present commercially available HCI solutions are structured, such as the Question Answer methods that use Knowledge Base to answer questions for structured queries. Ethics require more flexible solutions, as it involves personalization and analysis of unexpected responses.
3. There is no intelligence or decision making tool to build ethical intelligence in machines. The existing Artificial Intelligence is based on memory and emotional associations.
4. The semantics on which machines work are external. The machine does not have its own semantics to be able to prioritize decision aspects, therefore solutions permitting human autonomy are important.
5. Although the moral status to intelligent machines is under discussion, but building the foundation for moral intelligence in machines and tools for humans is missing.
6. The development of moral or ethical intelligence in systems is still in initial stages of development and requires experimentation and analysis for conclusive results.

Objectives of the Study

The Objectives of the study include:

1. To study the existing Artificial Intelligence based solutions for higher education and analyse how they can be mapped to the value education domain.
2. To identify Universal Human Values relevant for the AI based Ethical Decision model.
3. To design an AI based ethical intelligence model, using the identified Universal Human Values.
4. To validate the designed model using the various evaluation techniques

Methodology to be adopted

A combination of methods synthesizing quantitative and qualitative methodologies, data science validations and psychology tools would be used in this research. The ***proposed architecture of ethical intelligence*** is given below:

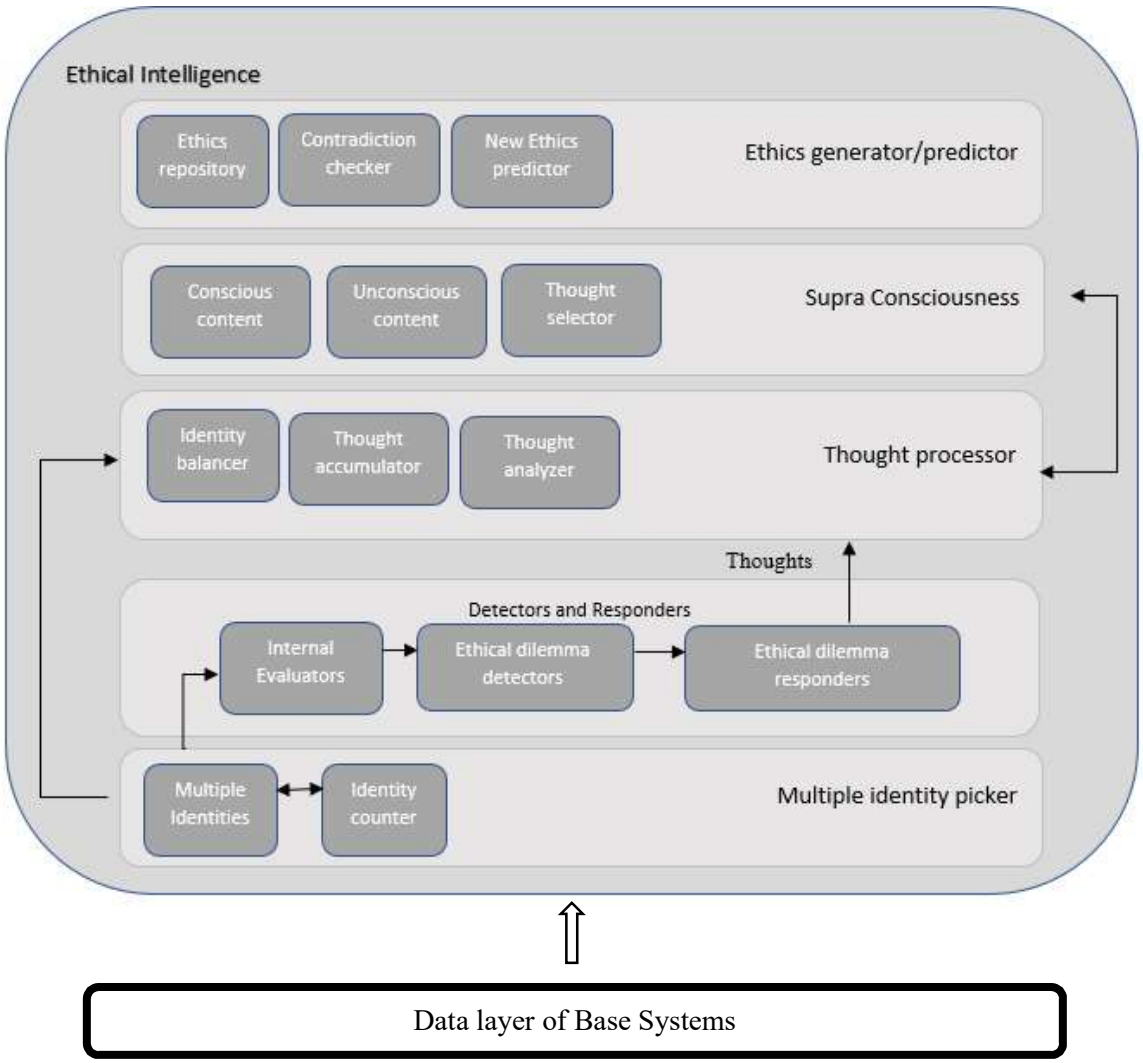

Figure 1: The Architecture of Ethical Intelligence

The architecture explains the causes and solutions for ethical dilemmas called contradictions. The design dissects and reconstructs ethical dilemmas into ethical decisions. Each of the layers is explained.

1. Our beliefs and needs define our identities or personal profile, while the identity counter addresses all need buckets for each identity in identity picker layer.

2. The dilemma detectors are questions in ethical intelligence tools that help in identifying dilemmas.
3. The second and third layer of Supra Consciousness and Though Processor is addressed using the Ethical Intelligence tool measuring ‘need wallet’ and ‘intention’ through Human Computer Interface (HCI)
4. The ethics predictor layer solves the dilemma using a value group classifier which facilitates the selection of values in a given novel dilemma.

If a dilemma or conflict is identified, the tool suggests solutions in report that counter the conflict. A base data is developed through each HCI tranaction and is used for learner personalization. The solution that passes all the parameters is defined as the ethical decision for the situation. The suggestions made through this design, help optimize the utilization of resources (decision) for balanced responsibilities, and optimizes the moral outcome.

Expected Outcomes of the Research

The research is expected to build a methodology for generating ethical guidelines in any dilemma using AI tools. The outcome would be in the form of an ethical decision making tool, which supports decision making using personalisation for learners. The ethical tool would have an impact on the decision making of the learners, which in turn can impact the overall quality of decisions made by developers of Artificial Intelligence algorithms, thus the society at large.

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Title: Ethical Intelligence for Decision-making From Human Value Education Perspective

Researcher: Ms. Shweta Bhatnagar Registration Number: 20/PhD/024

Supervisor: Dr. Rashmi Agrawal Department: Computer Applications

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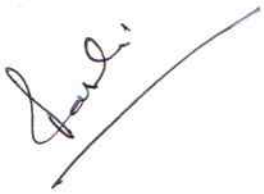

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Ethical Intelligence For Decision Making From Human Value Education Perspective

SHORT SYNOPSIS

by

Shweta Bhatnagar
20/Ph.D/024

Under the supervision of
Dr. Rashmi Agrawal
Professor, School of Computer Applications

SCHOOL OF COMPUTER APPLICATIONS

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES
SECTOR-43, SURAJKUND –DELHI ROAD, FARIDABAD – 121001

Abstract

Technology has taken the forefront in many areas of our daily lives. With the dawn of Artificial Intelligence, it becomes all the more important to focus on the use of ethical intelligence in decision making. This research attempts to uncover the complexities of the ethical intelligence architecture by using Philosophical studies as the base. The research is an attempt to address the metaphysical concepts using scientific methods. The ethical intelligence is built on ethical framework developed to address dilemmas. The research aims at proposing a model for ethical intelligence in decision making.

Keywords: Human Values, Ethical Decision Making, Ethical Tools, Explainable Artificial Intelligence, Ethical Intelligence, Moral Education, Artificial Intelligence in Education, Artificial Intelligence in Value Education

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